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The classroom language context and English and Spanish vocabulary development among dual language learners attending Head Start

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ABSTRACT

Using a nationally representative sample of dual language learners (DLLs) attending Head Start, this study investigated how the language used for instruction and the proportion of DLLs in the class was associated with English and Spanish receptive vocabulary development between the fall and spring (n = 531). Based on teacher report of the language or languages used for instructional activities in the classroom, teachers were categorized as using (1) English only, (2) a mix of English and Spanish, or (3) mostly Spanish. Three-level hierarchical linear models showed that children in classrooms using a mix of English and Spanish had English vocabulary scores that were no different than children in English-only classrooms. Children in mostly Spanish classrooms, however, had significantly lower spring English scores than children in English-only classrooms. In addition, children in English-only classrooms had significantly lower Spanish vocabulary scores than children in the other two categories of classrooms, which did not differ from each other. The higher the proportion of DLLs in a class the lower were spring English scores, but not Spanish vocabulary scores. Findings suggest that using bilingual instruction, and sharing classrooms with English-dominant peers can promote English vocabulary development without a cost to Spanish vocabulary development.

1. Introduction

Over the past few decades, schools in the United States have increasingly become home to a large and diverse population of children whose first language is not English. In 2013, 4.5 million language minority children were enrolled in schools in the United States. Most of these children speak Spanish at home, and are enrolled in the early elementary grades (National Center for Education Statistics [NCES], 2016). An area of debate in research and policy has concerned the best means of supporting achievement for young Dual Language Learners (DLLs), who are still developing their first language as they are learning English (Goldenberg, Nemeth, Hicks, Zepeda, & Cardona, 2012).

DLLs are at higher risk for long-term difficulties with language and literacy proficiency, as well as lower academic attainment, in part because they are likely to enter kindergarten having never been exposed to formal English vocabulary (Gándara, Rumberger, Maxwell-Jolly, & Callahan, 2003; Kieffer, 2012; NCES, 2003). Research has shown, however, that attending preschool may particularly benefit this at-risk group of students (Buysse, Peisner-Feinberg, Páez, Hammer, & Knowles, 2013; Gormley, 2008; Magnuson, Lahaie, & Waldfogel, 2006). The purpose of this paper is to examine the association between DLLs' vocabulary development and one aspect of the preschool experience–the classroom language context.

1.1. *DLLs' vocabulary development*

DLLs are a diverse group with wide variation in familial country of origin, socioeconomic status (SES) and language proficiency (Calderón, Slavin, & Sánchez, 2011; Halle, Hair, Wandner, McNamara, & Chien, 2012). Despite this variability, DLLs are more likely to come from families that are lower-income with few years of formal education, and with limited access to high-quality educational resources (Calderón et al., 2011; Gándara et al.,2003). Since there is robust evidence of class-based differences in vocabulary knowledge between high- and low-SES children (Farkas & Beron, 2004; Fernald, Marchman, & Weisleder, 2013; Hoff, 2013), low-income DLLs may face particular difficulties with developing oral language proficiency. Indeed, studies have found that DLLs substantially lag behind monolingual norms in their word production in both languages (Boyce, Gillam, Innocenti, Cook, & Ortiz, 2013; Páez, Tabors, & López, 2007), in some cases by as many as two standard deviations (Hammer, Lawrence, & Miccio, 2008). Most DLLs experience vocabulary growth over preschool and kindergarten in both English and Spanish (Páez et al., 2007), and given that DLL children are developing two languages, it is perhaps not surprising that they would lag behind monolingual children in both. Studies have found, however, that even when summing DLLs' vocabulary knowledge in both languages, a lag behind their

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same-age monolingual peers persists (Boyce et al., 2013).

Such findings are troubling, since early oral language skill is a critical component of later literacy achievement, which many researchers view as the foundation for academic success (Durham et al., 2007; National Early Literacy Panel, 2008; NICHD Early Child Care Research Network [ECCRN], 2005). One longitudinal analysis of DLLs using nationally representative data found that kindergarten vocabulary skill in both English and Spanish predicted levels of English reading in third through eighth grade (Kieffer, 2012). These findings mirror those of nationally representative studies with monolingual English-speaking children (NICHD ECCRN, 2005). Early difficulties with language skill in both English and Spanish may contribute to achievement gaps in both reading and math between DLLs and their language majority peers (Han, 2012; Reardon & Galindo, 2009). Such gaps remain after controlling for SES, and indicate that DLLs with limited English proficiency may fall as far as two grades behind by eighth grade (Halle et al., 2012).

1.2. The classroom language context

Research has consistently shown that DLL children benefit from the same high quality instructional environments as language majority children (Goldenberg, Hicks, & Lit, 2013; Slavin, Madden, Calderón, Chamberlain, & Hennessy, 2011). Nevertheless, there are special considerations for children who enter school with relatively weak English skills. Pragmatically, DLL children in the United States need skills in English to succeed in school and beyond. Developing or maintaining skills in their first language, however, hold notable cognitive benefits (Barac, Bialystok, Castro, & Sanchez, 2014), is important for maintaining connections to their family and culture (Wong-Fillmore, 2000), and can expand career opportunities later in life (Proctor, August, Carlo, & Barr, 2010; Rumbaut, 2014). Consequently, the appropriate balance of the use of the first and second languages in the classroom to support skills in both languages is an important consideration for early childhood educators of DLLs.

The classroom language context includes both the language of instruction and the peer composition of DLLs in the classroom. Both factors may exert a significant impact on DLL children's development in both English and Spanish. Bilingual instruction has long been a politically contentious topic, but the weight of the evidence from the early elementary grades indicates that providing instruction in the child's first language (L1) promotes the maintenance of the L1 at no cost to development of the child's second language (L2). A meta-analysis by Cheung and Slavin (2012) found a modest average effect size of 0.21 in favor of educational programs in elementary school that give children opportunities to develop and use their L1. Further, two recent studies offering evidence on the long-term effects of bilingual instruction found that children who received bilingual instruction in the early grades of elementary school experienced faster literacy and math growth, were more likely to be reclassified to mainstream education, and had higher English proficiency at the end of high school than children who received English-only instruction (Umansky & Reardon, 2014;Valentino & Reardon,2015).

Fewer studies have examined the language of instruction in the preschool years. A few randomized control trials (RCTs) have evaluated bilingual programs such as two-way immersion – in which teachers use the home language for half the day and English for the other half – and transitional bilingual – in which teachers initially use a higher proportion of the home language and eventually transition to a mix of both, and then to a higher proportion of English. These studies have found that relative to English-only programs, preschoolers in the bilingual programs enjoyed an advantage in their Spanish language skills, with no difference for their English skill (Barnett, Yarosz, Thomas, Jung, & Blanco, 2007; Durán, Roseth, Hoffman, & Robertshaw, 2013; Farver, Lonigan, & Eppe, 2009). For example, one study comparing the effects of a two-way Spanish immersion program and a monolingual English immersion program on preschoolers' Spanish and English vocabulary found no significant differences between the two treatment groups' English development, but the bilingual program resulted in substantial gains in Spanish skill (Barnett et al., 2007). A similar study comparing the effects of transitional bilingual and monolingual Head Start programs found that the positive effect of bilingual instruction on Spanish vocabulary, and the null effect of bilingual instruction on English vocabulary was sustained through a three-year follow-up (Durán et al., 2013). Taken together, these studies suggest that when children are instructed in their L1 in addition to their L2 in preschool, they are able to develop their L1 abilities, while also promoting, or at least not undermining, the development of their L2 abilities.

Many DLL preschoolers, however, do not have access to their home language in the preschool classroom (Figueras-Daniel & Barnett, 2013;Tabors & Snow,2003), and most preschools do not have formal bilingual programs, such as two-way immersion or transitional, instead using the L1 in an ad-hoc manner (Figueras-Daniel & Barnett, 2013). Head Start, for example, does not prescribe language use; the language of instruction is left to individual programs to decide, and programs serving DLL Spanish speakers vary considerably in the proportion of English and Spanish used by teachers. The effects on language and literacy development found in studies of classrooms where Spanish is used at the teacher's discretion rather than within a structured program as evaluated by the RCTs discussed above, are not necessarily seen (Burchinal, Field, López, Howes, & Pianta, 2012; Hindman & Wasik, 2015). One observational study, for example, found no evidence of a main effect of the proportion of Spanish used in the classroom on English literacy skill (Burchinal et al., 2012), and in a study with Head Start preschoolers, the association between using any Spanish for instruction and vocabulary skill in Spanish or English was not significant (Hindman & Wasik, 2015).

In summary, relatively few studies have examined the language of instruction in preschool. Evidence from RCTs suggests that using both English and Spanish results in similar language development in English, and stronger development in Spanish relative to monolingual English instruction. In contrast, findings from descriptive studies examining natural variation in English- and Spanish use in preschool are mixed. Some have not found significant associations between the language(s) used in the classroom and child outcomes, and others have found a negative association between Spanish use and English language proficiency.

With few exceptions (e.g. Burchinal et al., 2012) studies on the effects of the languages used for instruction largely do not capture the wide variation in language contexts outside of prescribed bilingual education programs, as evaluated through RCTs. Though it has been established in the literature that using the L1 has value, and that increased exposure to a language is correlated with gains in that language (Boyce et al., 2013; Gámez, 2015; Pearson, Fernandez, Lewedeg, & Oller, 1997), it is unclear whether there is an optimal balance for teachers' use of the first and second languages. Furthermore, the bilingual programs that have been evaluated with RCTs, such as two-way immersion and transitional bilingual, are intended to use English and Spanish equally, or with greater initial use of Spanish that transition to greater use of English over the school year. Such programs do not necessarily reflect the range of language use in the classroom, in which teachers may use more Spanish than English for instruction. Consequently, it is unclear how the balance of using more Spanish than English in the classroom relates to children's vocabulary development in their L1 and L2. Furthermore, it is unclear from studies that evaluate specific bilingual programs whether the effects identified are due to the specific instructional program or to the language used for instruction (Buysse et al., 2013).

The present study takes advantage of the natural variation in teachers' use of Spanish and English in Head Start programs to examine differences in classroom language use on children's Spanish and English vocabulary development. Based on evidence from evaluations of bilingual programs, I expect that children in classrooms that use a mix of English and Spanish for instruction will have similar English vocabulary

scores to children in classrooms using English only, while children in classrooms using mostly Spanish may have slower English vocabulary growth, relative to English-only classes. I would expect the reverse to be true for Spanish vocabulary. Specifically, I hypothesize that children's Spanish vocabulary scores will not be different when they receive instruction mostly in Spanish versus in both English and Spanish, but that children in English-only classrooms will have lower Spanish vocabulary growth than children in mostly Spanish classrooms.

1.3. Peer composition of classrooms

The classroom language context is not limited to the languages used by teachers; peers may also influence language development. A small but growing number of studies suggest that English-speaking monolingual children's language skills benefit from sharing early childhood classrooms with classmates who have relatively high language abilities (Justice, Petscher, Schatschneider, & Mashburn, 2011; Mashburn, Justice, Downer, & Pianta, 2009; McGregor, 2000). Peers' English language skill may be particularly important for DLL children developing English as a second language. In two studies with preschool DLL children that examined the language of peers, the proportion of total interactions that occurred with peers in English was positively associated with DLL children's year-end English expressive vocabulary knowledge, controlling the teacher's use of English, and children's total language use and language proficiency in the fall (Palermo and Mikulski, 2014; Palermo et al., 2013). These findings suggest that exposure to peers' English may support DLL children's English word production.

Extant research has not provided evidence on whether the composition of DLLs in classrooms is related to DLLs' native language and English language development. One study with kindergarteners and first graders, however, found that higher proportions of English learners in the classroom was associated with lower English reading test score gains for native English speakers (Cho, 2012). Furthermore, since prior research has found that teachers use the child's L1 or L2 in response to children's own language preferences (Stipek, Ryan, & Alarcón, 2001), it is likely that teachers use more Spanish than English in classrooms with higher proportions of DLLs. Prior research has not, however, examined the independent contribution of these two aspects of the classroom language context. In the present study I reasoned that DLLs would have more opportunities to hear and to practice English if they shared classrooms with relatively more native English-speakers, which would be associated with more rapid English vocabulary development than if they were in classrooms with mostly other DLLs. A higher proportion of native English speakers, however, may conversely limit children's exposure to Spanish vocabulary, and relate to lower growth in Spanish vocabulary. Higher proportions of DLLs, on the other hand, may give children more opportunities to hear and speak Spanish, and thus support their Spanish vocabulary ability, while perhaps limiting their English vocabulary ability.

1.4. The current study

A number of studies have found that a range of factors impact the academic development of DLL children living in poverty (Halle et al., 2012; Kim, Curby, & Winsler, 2014). In this study, I examine a key part of DLL children's preschool experience: the language context of the classroom. I build on prior studies of teacher language with Head Start DLLs (Hindman & Wasik, 2015) by including more nuanced indicators for the amount of English and Spanish instruction used in the classroom. I also analyze a less examined element of the classroom language context, the proportion of children in the class who are DLLs. I thus provide evidence on the effects of differing degrees of bilingual instruction, as well as the classroom peer composition, using a nationally representative sample of low-income preschoolers. My research questions are as follows:

(1) Is using English only, a mix of both English and Spanish, or mostly Spanish associated with DLLs' vocabulary growth in English and Spanish?
(2) Is the proportion of DLLs in the classroom associated with DLLs' vocabulary growth in English and Spanish?

2. Method

2.1. Data

Data from the Head Start Family and Child Experiences Survey (FACES) were analyzed in this study. The FACES study is a part of the Head Start Program Performance Measures Initiative. It is an ongoing, national, longitudinal study of the children and families served by Head Start as well as the characteristics of Head Start programs and classrooms (Malone et al., 2013). To date, five FACES cohorts have been fielded, and the present study utilizes data from the most recent available cohort, FACES 2009.

FACES 2009 is a nationally representative sample of 3- and 4-year-old children and their families who entered Head Start for the first time in the fall of 2009. Participating programs represented a probability sample, selected from among 2600 study-eligible programs. FACES researchers stratified program sampling by census region, urbanicity, percentage of racial or ethnic minority enrollment, percentage of dual language learners, percentage of children with disabilities, and the program status as a public school district grantee. Probability samples of centers were selected within programs; classrooms were selected within each center, and children were randomly selected within classrooms. Additional details on the sampling procedure can be found in the Head Start FACES 2009 User Guide (Malone et al., 2013). The full FACES sample consisted of 60 Head Start programs, 129 centers, 486 classrooms and 3349 children who were first assessed in fall, 2009.

2.2. Procedure

FACES researchers collected data at four waves, and the current study utilizes data from the first two waves: the fall of 2009 when children were 3 or 4 years old, and the spring of 2010 when the same children had completed one year of Head Start. Highly trained, bilingual researchers administered one-on-one assessments of children's academic, cognitive and executive functioning for each wave of data collection. Children whose home language was Spanish were administered the vocabulary assessments in Spanish as well as English.

Additionally, Head Start teachers completed computer or paper-pencil surveys on individual study children, as well as information about their teaching practices, their own background, and their classroom's demographics. Head Start center directors were interviewed regarding their demographic and educational backgrounds and regarding information about the services provided to Head Start teachers, such as training and technical assistance. Parents were interviewed at each data collection wave via one-on-one phone calls. Children's demographic information was collected in fall 2009, and parents responded to questions about their income and employment status at each wave of data collection.

2.3. Participants

Participants for this study were 531 children entering Head Start for the first time in fall of 2009 who according to parent reports, spoke Spanish at home and were Hispanic or Latino. The sample for the current study included children with complete English and Spanish vocabulary scores in the fall and spring, and complete child, family, classroom and center-level data used as covariates. Children were, on average, 46.7 months old (SD = 6.24) in the fall of 2009. As would be expected for a Head Start sample, children were from low-income families: 70.8% of families in the sample fell below the poverty threshold,

Table 1
Means and standard deviations overall and by the language of instruction.

	Overall		English only		Mix English & Spanish		Mostly Spanish	
	Mean%	(SD)	Mean%	SD	Mean%	SD	Mean%	SD
Main outcomes and predictors								
Receptive vocabulary assessments								
Fall English	62.6	19.8	64.0	20.8	63.5	19.5	53.4	19.7
Spring English	72.3	14.9	75.9	13.6	72.9	14.7	63.0	15.0
Fall Spanish	85.2	12.9	84.9	13.5	85.1	12.6	86.6	14.4
Spring Spanish	85.2	15.0	81.0	15.7	85.1	14.8	91.3	14.1
Language of instruction (%)								
Monolingual English	17.1							
Mix English and Spanish	75.4							
Spanish dominant	7.54							
Proportion DLLs	0.552	0.336	0.365	0.283	0.571	0.329	0.786	0.330
Child and family characteristics								
Child age in months	46.7	6.24	47.5	6.13	46.4	6.15	48.2	6.90
Male (%)	49.7		58.2		46.8		61.5	
Below poverty line (%)	70.8		71.6		71.4		65.4	
Mother has HS diploma or higher (%)	37.1		37.3		37.4		34.6	
Teacher and classroom characteristics								
Child to teacher ratio	8.36	2.32	8.74	2.26	8.28	2.39	8.47	1.70
Years teaching	12.5	8.48	13.0	9.06	12.1	8.42	15.2	7.63
Teacher has BA or higher (%)	45.2		55.9		42.7		46.7	
Teacher is Latino (%)	41.2		5.88		44.0		93.3	
Teacher speaks language other than English (%)	62.3		17.6		69.3		93.3	
Full day Head Start (%)	46.7		64.7		45.3		20.0	
Number of DLLs	9.48	6.01	6.29	5.16	9.93	5.89	12.3	6.60
Center characteristics								
Director years experience	11.0	8.46						
Provides TA monthly or more (%)	82.4							

Note: $N = 531$. HS = High School, TA = Technical Assistance.

and only 37.1% of mothers held a high school diploma or higher.

Children were nested in 199 classrooms and 74 centers. Teachers had, on average, 12.5 years of experience ($SD = 8.48$), and just under half, 45.2%, had at least a BA or higher. Forty-one percent of teachers in the present sample identified as Hispanic or Latino, and 62.3% spoke a language other than English. Center directors had, on average, 11 years of experience ($SD = 8.46$), and most centers, 82.4%, provided training and technical assistance to teachers on a monthly basis or more. Full demographic and background information for children, families, classrooms and centers are presented in Table 1.

2.4. Measures

2.4.1. Peabody picture vocabulary test–4th edition (PPVT)/test de vocabulario de imágenes peabody (TVIP)

The PPVT-4 (Dunn, Dunn, & Dunn, 2006) was used to assess children's English receptive vocabulary, and the TVIP (Dunn, Padilla, Lugo, & Dunn, 1986) was used to assess children's Spanish receptive vocabulary. In both the PPVT and TVIP, children are shown sets of four drawings; the assessor reads a word aloud, and children are asked to indicate the drawing that best represents the word's meaning. The entry point to the test is determined by the child's age, and a basal score is established when a child correctly identifies eight consecutive items. A ceiling is established when a child incorrectly identifies six of eight consecutive items, ending the test. Raw scores are determined by adding the number of correct responses between the basal and the ceiling. Standard scores are derived from the raw scores, with a mean of 100 and a standard deviation of 15, allowing comparisons between study children and their same-age peers.

The PPVT-4 has been normed and validated with a nationally representative sample of children and adults, and has high reliability, with internal consistency alphas ranging from 0.96 to 0.97. The TVIP was normed on a sample of Mexican and Puerto Rican monolingual children and adults. The test publishers report an internal consistency coefficient of 0.93. Test-retest reliability (alpha) in the present sample was 0.83 for the PPVT and 0.81 for the TVIP.

2.4.2. Dual language learner status

In the fall of 2009, parents reported on the linguistic background of their children and households. The sample of Latino DLLs included children whose parents answered yes to whether: (1) a language other than English was spoken in the home, (2) that language was Spanish, and (3) the child's ethnicity was Hispanic or Latino.

2.4.3. Language of instruction

In a questionnaire, lead teachers were asked a series of questions about the languages they used for classroom activities. They were first asked whether they used English and whether they used Spanish for instruction. The language used for instruction was not mutually exclusive, and many teachers reported using both English and Spanish. Teachers were then asked what language they used *the most* for (1) reading, and (2) speaking to the group to present information or give instructions. These questions were mutually exclusive, and teachers indicated only one language for each activity. After they reported the language used the most, they were asked if they used *any other* language to read and speak to the group in addition to the first language reported. This question was again mutually exclusive, and teachers only reported one language.

Based on teachers' report of the languages used for (1) instruction, (2) reading, and (3) speaking to the group, a three-point indicator was created, where a higher value corresponded to using more Spanish in the classroom. Teachers in the first group, "monolingual (ML) English" (17.1%), used English and no Spanish for instruction, reading, and speaking to the group. Teachers in the second group, "mix of English and Spanish" (77.6%) used both English and Spanish for instruction, and they either used English the most for reading and speaking to the

group, with Spanish as a secondary language, or a combination of English and Spanish the most for one activity each. Finally, teachers in the third group, "mostly Spanish" (9.79%), used Spanish for instruction, and they used Spanish *the most* for reading and speaking to the group. Only one teacher used no English in the classroom and was excluded from analyses. Only the first group, "monolingual English," represents monolingual instruction.

2.4.4. Proportion of DLLs

Lead teachers also provided information about the number of DLLs in the classroom and their total class size. To calculate the proportion of DLLs, the number of teacher-reported DLLs in the classroom was divided by the teacher-reported class size. The majority of the DLLs in the sample shared classrooms with children who spoke English or Spanish; only 17 children (3%) were in classrooms where teachers reported that children spoke a language other than English or Spanish. These children were retained in analyses.

2.4.5. Child and family characteristics

In fall 2009 and spring 2010, parents reported the demographic characteristics of children and their families, including the child's ethnicity, gender, and linguistic background. Parents also reported on their annual household income, household size, and highest educational attainment. Parents' education was dummy coded to represent having some college or higher, and household income was adjusted for household size and dichotomized to represent being above the poverty threshold.

2.4.6. Teacher and classroom characteristics

In a questionnaire, lead teachers reported their demographic and background characteristics, including ethnicity, educational level and years of teaching experience. They also reported the teacher-to-child ratio of their classrooms, and whether their programs were half day, full day or home-based. Teacher education was dummy coded to represent having a BA or higher.

2.4.7. Center director characteristics

Head Start center directors were interviewed in the fall of 2009. They reported on the services their centers provide, including training and technical assistance, and on their own years of experience as a director.

2.5. Analytic strategy

Research questions were addressed by estimating three-level Hierarchical Linear Models (HLM), using the *mixed-* command in Stata 14. HLM is used to model the complex error structure due to nesting (Raudenbush & Bryk, 2002); in this case, children, i (level-1) are nested within classrooms, j (level-2), and centers, k (level-3). All models included a random intercept for children, classrooms and centers. A normalized sampling weight at the child level (PRA12WT) was also included, which accounts for the probability of child selection, conditional on classroom and center selection. Random coefficients were not modeled, because preliminary analyses suggested that such models were over-specified, due to the relatively small cell size in each language of instruction group.

Separate models were run for English and Spanish receptive vocabulary. At level 1, the model took the following general form:

Level 1:

$$y_{ijk} = \pi_{0jk} + \pi_{1jk}(pretest_{ijk}) + X_{ijk}\delta_{0jk} + \epsilon_{ijk}$$

where y_{ijk} represents the average spring receptive English or Spanish vocabulary score for student i in classroom j and center k. At the child level, π_{0jk} is the mean vocabulary score in classroom j and center k, π_{1jk} represents the effect of the fall English and Spanish vocabulary score on spring vocabulary, $\boldsymbol{X}_{ijk}$ represents a vector of child and family covariates (child age, poverty status, and maternal education), and ϵ_{ijk} is the individual, between-child variation in receptive vocabulary scores.

Level 2:

$$\pi_{0jk} = \beta_{00k} + \beta_{01}(mix\quad English/Spanish_{jk}) + \beta_{02}(mostly\quad Spanish_{jk}) + \boldsymbol{X}_{jk}\mu_{0jk} + r_{0jk}$$

$$\pi_{1jk} = \beta_{10k}$$

At level 2, β_{00k} is the overall intercept, or mean vocabulary score in center k. The terms β_{01} and β_{02} represent dummy-codes for the effect of classrooms using a mix of English and Spanish and classrooms using mostly Spanish respectively, relative to the excluded group, monolingual English classrooms. For models predicting spring vocabulary with the proportion of DLLs, β_{01} and β_{02} are replaced with a single coefficient, β_{01}. In addition, $\boldsymbol{X}_{jk}$ is a vector of classroom-level covariates (the child to teacher ratio, years of teaching experience, teacher holds a BA, teacher is Hispanic/Latino, classroom is full-day or half-day), and r_{0jk} is the classroom-specific random intercept, representing the within-center and between-classroom variation in scores

Level 3:

$$\beta_{00k} = \gamma_{000} + \boldsymbol{X}_k\lambda_0 + u_{00k}$$

$$\beta_{10k} = \gamma_{100}$$

Finally, at level 3, $\boldsymbol{X}_k$ is a vector of center-level covariates (center provides training and technical assistance, and director years of experience). Here, I include a random intercept for centers, u_{00k}, which represents the between-center variation in initial scores.

For each English and Spanish vocabulary outcome, I built up progressively complex models. The first models predicted y_{ijk} with: (1) the language of instruction, (2) the proportion of DLLs, (3) both the language of instruction and the proportion of DLLs, and controlled only for fall language scores. The next set of models added covariates, $\boldsymbol{X}_{ijk}$, $\boldsymbol{X}_{jk}$, and $\boldsymbol{X}_{k,}$ and the final, fully specified set of models added sampling weights.

3. Results

3.1. Descriptive statistics

Means and standard deviations for all study variables at the child, family, classroom and center levels, overall and by the language of instruction are presented in Table 1. The mean standard vocabulary scores first show that, as has been found in prior studies, the low-income DLLs in the sample had low fall vocabulary scores, with English standard scores over two standard deviations below the nationally normed mean (M = 62.6, SD = 19.8), and fall Spanish vocabulary scores one standard deviation below the national mean (M = 85.2, SD = 12.9). As shown in Table 1, children in English-only classrooms entered Head Start with higher English vocabulary scores than children in classrooms using a mix of English and Spanish or mostly Spanish. In the spring, however, children's average English vocabulary scores increased overall, and in each of the language-of-instruction groups. Across the language-of-instruction groups, DLLs began the year with approximately equal Spanish receptive vocabulary scores. Overall, children's standard Spanish vocabulary scores remained approximately the same between the fall and spring (indicating that the DLLs' vocabulary scores relative to their same-age peers was the same in the fall and spring), but children in English-only classrooms had Spanish receptive vocabulary scores that decreased between the fall and spring. Children in mostly-Spanish classrooms, on the other hand, had Spanish scores that increased between the fall and spring.

Table 1 shows that many of the DLLs in the sample were in classrooms with other DLL children, with an overall mean of 9.48 (SD = 6.01) or 55.2% DLLs. There were, however, more DLLs in

Table 2
Bivariate correlations for main study variables.

		(1)	(2)	(3)	(4)	(5)
1.	Fall English receptive	–				
2.	Spring English receptive	0.73***	–			
3.	Fall Spanish receptive	0.14**	0.13**	–		
4.	Spring Spanish receptive	0.01	0.10*	0.55***	–	
5.	Language of instruction[a]	−0.12**	−0.19***	0.03	0.16***	–
6.	Proportion DLLs	−0.08†	−0.14**	0.034	0.09*	0.30***

Note: $N = 531$.
[a] Higher values indicate more Spanish instruction.
† $p < 0.10$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

classrooms that used more Spanish for instruction. English-only classrooms included an average of 6.29 ($SD = 5.16$), or 36.5% DLLs. The proportion of DLLs in English-only classrooms ranged from 5% to 95%, but a median split indicated that only 18% of classrooms had a higher proportion of DLLs than the sample median. Mixed English and Spanish classrooms included an average of 9.93 ($SD = 5.89$) or 57.1% DLLs, ranging from 5% to 100%. Forty-one percent of mixed English and Spanish classrooms had a higher proportion of DLLs than the sample median. Finally, mostly Spanish classrooms included 12.3 ($SD = 6.6$), or 78.6% DLLs on average, ranging from 6% to 100%. Most of the mostly Spanish classrooms, 73%, had a higher proportion of DLLs than the sample median.

Table 2 shows bivariate correlations between the main study outcomes and predictors. These correlations show that the language of instruction was significantly correlated with English receptive vocabulary scores in the fall ($r = -0.12, p < 0.01$) and spring ($r = -0.19$, $p < 0.001$), and Spanish receptive vocabulary scores in the spring ($r = 0.16$, $p < 0.001$), but not the fall. Consequently, the more Spanish spoken in the classroom, the lower were children's English vocabulary scores in the fall and spring; the opposite was true for Spanish vocabulary scores in the spring. Similarly, children with lower English vocabulary scores and higher Spanish vocabulary scores tended to be in classrooms with higher proportions of DLLs. The proportion of DLLs in the classroom was marginally significantly correlated with English vocabulary scores in the fall ($r = -0.08$, $p = 0.07$), and significantly correlated with English receptive vocabulary scores in the spring ($r = -0.14, p < 0.01$). In addition, the proportion of DLLs was correlated with Spanish receptive vocabulary scores in the spring ($r = 0.09$, $p < 0.05$) but not the fall. Finally, the language of instruction and proportion of DLLs were significantly correlated ($r = 0.30$, $p < 0.001$), corroborating the summary statistics in showing that classrooms using more Spanish for instruction also had higher proportions of DLLs

3.2. The classroom language context and English and Spanish vocabulary

I examined associations between the classroom language context – 1) the language of instruction, and 2) the proportion of DLLs in the class – on children's English- and Spanish vocabulary skill in the spring net of their respective English- and Spanish vocabulary skill in the fall. Because the language of instruction and the proportion of DLLs were correlated, I also assessed the unique contribution of both variables to spring English and Spanish vocabulary scores. As discussed previously, I created progressively complex models, adding in turn covariates and weights. Results were robust across model specifications, and for parsimony, results from the final, fully specified model are presented in Table 3. The models control for fall English and Spanish receptive vocabulary scores, as well as child, classroom and center covariates, and they are weighted to account for the probability of selection. In order to examine differences between classrooms in each language configuration, the language of instruction is coded with English monolingual classrooms as the reference group.

3.3. English vocabulary

Results for the language of instruction and English receptive vocabulary are presented in column 1 of Table 3. Controlling fall receptive vocabulary skill, and child, classroom and center characteristics, children in classrooms using a mix of English and Spanish did not score significantly differently on spring English receptive vocabulary relative to children in classrooms using English only for instruction, $b = -1.80$, $p > 0.05$. However, children receiving instruction mostly in Spanish scored significantly lower in English vocabulary than those in English-only classes, $b = -6.93$, $p < 0.001$.

I next examined the relation between the proportion of DLLs in the classroom and English vocabulary development. Results are presented in column 2 of Table 3. Findings indicated that a higher proportion of DLLs was associated with significantly lower English receptive vocabulary scores in the spring, $b = -4.98$, $p < 0.01$, controlling for fall English vocabulary and the other covariates.

When both the language of instruction and the proportion of DLLs were included in the same model (Table 3, column 3), the findings from the prior models examining the contribution of each persisted. Thus, though the language of instruction and the proportion of DLLs were correlated, they each contributed unique variance to English receptive vocabulary development between the fall and spring.

3.4. Spanish vocabulary

I next examined the relation between the amount of English and Spanish instruction and children's spring Spanish vocabulary. The variable for teacher language was dummy coded relative to English-only instruction as described above. Results for spring Spanish vocabulary development are presented in column 4 of Table 3. Multilevel models showed that, controlling for fall receptive vocabulary in both English and Spanish and covariates at all three levels, children in classrooms that used a mix of English and Spanish had higher spring receptive Spanish vocabulary scores than children in classrooms using English only, $b = 3.78$, $p < 0.01$. Similarly, children in classrooms using mostly Spanish scored significantly higher on the spring Spanish receptive vocabulary assessment than children in English-only classrooms, $b = 7.21$, $p < 0.001$.

In contrast to English receptive vocabulary, the proportion of DLLs in the classroom was not significantly associated with spring Spanish vocabulary skill, $b = 1.42$, $p > 0.05$. When both the language of instruction and the proportion of DLLs predicted Spanish vocabulary development (Table 3, column 6), these findings persisted. Teachers' use of English and Spanish in the classroom was significantly associated with Spanish vocabulary skill, but the proportion of DLLs in the class was not.

4. Discussion

DLLs are a rapidly expanding demographic group and they are at risk for a range of poor academic outcomes, including slower development in English and Spanish vocabulary. Understanding how the classroom language context can promote language development among low-income DLLs is critical to best supporting their needs. In this study, I assessed whether teachers' use of English, Spanish, or a mix of both, and the proportion of DLLs in the classroom were associated with English and Spanish vocabulary development over a year in Head Start.

4.1. Language of instruction

Consistent with the view that children make gains in the language

Table 3
HLM results for spring English and Spanish receptive vocabulary by the language of instruction.

	English receptive vocabulary						*Spanish receptive vocabulary*					
	(1)		(2)		(3)		(4)		(5)		(6)	
Fixed effects	*b*	(SE)	*b*	(SE)	*b*	(SE)	*b*	SE	*b*	(SE)	*b*	(SE)
Intercept	77.6***	(1.62)	75.0***	(1.45)	76.7***	(1.57)	82.4***	(3.15)	85.9***	(3.08)	82.4***	(3.06)
Monolingual English	Ref.		Ref.		Ref.		Ref.		Ref.		Ref.	
Mix English and Spanish	−1.80	(1.23)			−1.20	(1.21)	3.78**	(1.24)			3.76**	(1.27)
Mostly Spanish	−6.93***	(1.73)			−5.47**	(1.78)	7.21***	(1.90)			7.13***	(2.01)
Proportion DLLs[a]			−4.98**	(1.60)	−4.11*	(1.65)			1.42	(2.16)	0.20	(2.21)
Fall English vocabulary[a]	0.54***	(0.03)	0.54***	(0.03)	0.54***	(0.03)	−0.05	(0.03)	−0.06	(0.03)	−0.05	(0.03)
Fall Spanish vocabulary[a]	0.06*	(0.03)	0.06*	(0.03)	0.06*	(0.03)	0.70***	(0.04)	0.70***	(0.04)	0.70***	(0.04)
Child age[a]	0.12	(0.08)	0.12	(0.08)	0.12	(0.07)	0.22*	(0.09)	0.22*	(0.09)	0.22*	(0.09)
Below poverty line	0.76	(0.95)	0.59	(0.99)	0.56	(0.99)	0.29	(1.72)	0.34	(1.78)	0.30	(1.76)
Mom has HS diploma+	−0.06	(0.46)	−0.19	(0.47)	−0.18	(0.47)	1.40	(0.72)	1.41	(0.75)	1.40	(0.74)
Male	−1.14	(0.60)	−1.36*	(0.59)	−1.20*	(0.59)	−2.10	(1.08)	−1.99	(1.07)	−2.10	(1.08)
Child to teacher ratio[a]	0.29	(0.18)	0.45*	(0.23)	0.44*	(0.19)	0.22	(0.37)	0.19	(0.34)	0.22	(0.35)
Years teaching[a]	−0.05	(0.06)	−0.08	(0.07)	−0.06	(0.06)	−0.05	(0.06)	−0.04	(0.07)	−0.05	(0.07)
Teacher has BA or higher	−0.58	(0.99)	−1.08	(0.98)	−0.62	(0.96)	1.00	(1.15)	1.47	(1.23)	1.01	(1.16)
Teacher is Latino	−1.43	(1.08)	−1.67	(1.05)	−0.96	(1.07)	1.03	(1.39)	1.91	(1.46)	1.00	(1.45)
Full day Head Start	0.09	(1.08)	0.25	(1.03)	−0.10	(1.01)	−1.17	(1.24)	−1.60	(1.27)	−1.17	(1.26)
Provides TA monthly+	−2.58*	(1.20)	−1.75	(1.26)	−2.55*	(1.24)	−0.85	(2.10)	−1.29	(2.25)	−0.86	(2.09)
Director years experience[a]	−0.11	(0.07)	−0.12	(0.07)	−0.13	(0.07)	0.05	(0.07)	0.04	(0.08)	0.05	(0.07)
Random effects												
Center intercept variance	2.50*	(0.99)	2.29*	(0.78)	2.20	(0.95)	2.81	(1.76)	3.28**	(1.34)	2.83	(1.80)
Classroom intercept variance	0.45	(4.73)	0.96	(2.01)	0.54	(3.75)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Residual variance	9.27***	(0.40)	9.26***	(0.39)	9.25***	(0.39)	11.7***	(0.57)	11.7***	(0.56)	11.7***	(0.57)

Note: $N = 531$. HLM = Hierarchical Linear Models. Dependent variables in column headers. All models include sampling weights.
[a] Variable is grand mean centered.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

that they are exposed to (Pearson et al., 1997), the findings of the present study indicated that children who heard only English in the classroom had significantly higher English vocabulary skills than children in classrooms using mostly Spanish. Children who were exposed to a mix of English and Spanish in the classroom, however, did not have significantly different English vocabulary scores relative to children in English-only classrooms. These findings remained after controlling for the proportion of DLLs, and a range of child, family, classroom, and center covariates. Thus, using both English and Spanish for instruction did not appear to undermine preschoolers' growth in English vocabulary skills, relative to using English only for instruction.

These findings suggest that teachers' use of a mix of English and Spanish in classrooms is akin to bilingual instruction programs, such as two-way immersion and transitional bilingual. In both of these programs, teachers use the child's native language in addition to English, intending to use the L1 in an equal mix with the L2, or transitioning to greater use of the L2 over the school year. The current study's findings for English vocabulary are thus consistent with evaluations of bilingual programs, which have found that Spanish instruction in the context of these programs did not negatively affect English language acquisition, relative to monolingual English classes (Barnett et al., 2007; Durán et al., 2013; Farver et al., 2009). The present findings thus contribute to the mounting evidence that instructing young children in their native language in addition to English is associated with similar gains in English vocabulary as instructing children in English alone.

I do not show, however, that using more Spanish than English is beneficial to DLL preschoolers' vocabulary skills. I extend prior findings in the current study by comparing classrooms that used mostly Spanish to monolingual English classrooms, and to classrooms that used a mix of English and Spanish. My findings are consistent with some studies of the use of Spanish in the classroom (Collins, 2014; Slavin et al., 2011) in showing that the use of more Spanish for instruction was associated with lower English vocabulary skill. It is possible that in these studies, teachers used more Spanish than English in the classroom. In studies that did not find a negative effect of Spanish instruction on English vocabulary, on the other hand, teachers may have balanced the use of Spanish with English instruction.

Considering Spanish vocabulary development, children whose teachers used mostly Spanish, and children whose teachers used as a mix of English and Spanish had higher Spanish vocabulary scores in the spring than children in monolingual English classrooms. In addition, though children in classrooms of each language configuration began Head Start with similar Spanish vocabulary skills, the average Spanish vocabulary abilities of children in monolingual English classrooms decreased between the fall and spring (Table 1). Children in classrooms that used at least some Spanish experienced an increase in their average standard Spanish vocabulary scores between fall and spring. The current study results are thus further consistent with prior studies showing that monolingual English instruction is associated with lower Spanish vocabulary skill (Barnett et al., 2007; Durán et al., 2013; Farver et al., 2009). Overall these patterns show that using a mix of Spanish and English for instruction may be the best strategy for developing Spanish vocabulary without a cost to the development of English vocabulary.

Taken together, the current study's findings suggest that if some Spanish instruction does not supplement English instruction, there are linguistic tradeoffs – gains in English vocabulary may be accompanied by loss in Spanish. Such loss may be significant, since maintaining a first language is valuable in and of itself (Barac et al., 2014), and may support and mediate development of long-term English skills. This study thus underscores the importance of state, district, and school-based policies that support the instruction of preschool-aged DLLs in both English and their native language, with the goal of promoting

development in the L1 as well as the L2. Given the dominant status of English in American culture, and consequently in schools (Escamilla, 1994), policies at the school, district, and state-levels that explicitly endorse the use of children's L1 are likely needed to ensure that the L1 is robustly implemented for instruction (Stipek et al., 2001).

At the same time, the present study demonstrates that using Spanish at the exclusion of English in the classroom may come at a cost to English vocabulary development. Using a mix of both English and Spanish, on the other hand appears to mitigate some of this Spanish language loss without a cost to the development of English vocabulary.

4.2. The proportion of DLLs

In addition to the language of instruction, the findings suggest that the more DLL classmates children have, the less growth they may experience in their English vocabulary skills, an effect that remained after controlling for the language of instruction and child, family, classroom, and center covariates. These findings are consistent with those of another study using national representative data (Cho, 2012), which found that sharing classrooms with more DLLs was associated with lower reading skill for non-DLLs. To the degree that developing English skills is a goal, these results point to the value of efforts to integrate Spanish-speaking children with native English speaking peers. Such integration is not easy to accomplish, given common geographical segregation of ethnic groups. But it is worth considering in determining where Head Start programs are located and how children are allocated to classes.

Having a high proportion of DLLs was not associated with Spanish vocabulary skills. There are a few possible explanations for the lack of effect. First, it is possible that though children in the classroom were classified as DLLs, they still spoke more English than Spanish at school, limiting children's opportunities to learn new Spanish vocabulary words from one another. Alternatively, even if children were exposed to more frequent Spanish from their DLL peers, it is possible that their classmates used Spanish vocabulary that was already familiar, and would thus not contribute to vocabulary growth. One limitation to these findings is that I was unable to determine the extent to which children interacted in English or Spanish. In addition, though analyses revealed a linear relation between the proportion of DLLs in the classroom and children's English vocabulary, the optimal balance of DLLs and non-DLLs is unclear. Future studies should examine the frequency and quality of peer interactions, as well as peer language ability in order to better understand this potentially important social influence on language development.

4.3. Implications and limitations

Taken together, these results are consistent with prior studies in demonstrating that the languages used by teachers and peers are an important aspect of the classroom context for young, low-income DLLs. I expand on prior literature by comparing classrooms that use mostly Spanish in addition to bilingual English and Spanish instruction, and English-only instruction using a nationally representative sample of children attending Head Start. While the descriptive nature of these findings preclude causal inference, the results reflect how children are distributed among Head Start classrooms, and how the affordances of the classroom in turn are associated with their language development. These findings should thus be interpreted in the context in which low-income DLL children attend Head Start classrooms that use English, Spanish or a mix of both for instruction.

For example, the correlation results showed that children with weaker initial English skills were more likely to be in classrooms that used more Spanish for instruction, and that had higher proportions of DLLs. It is unclear from the current study whether parents chose to send their children to majority Spanish classrooms because their home language is used, or whether teachers responded to the low English proficiency of students by using more Spanish in the classroom (Stipek et al., 2001). Nevertheless, these findings demonstrate that children who are at the highest risk of later academic difficulties because of their low initial English skill (Durham et al., 2007; Farkas & Beron, 2004) are the least likely to be in classrooms using the English they need to develop their English vocabulary. Preschool centers should thus take steps to monitor DLLs' English proficiency upon preschool entry, and ensure that children with low English proficiency have access to both their native language and to English in the classroom.

This study has several limitations. Primarily, while the observational nature of this nationally representative data provide a useful and ecologically valid snapshot of the experiences of low-income DLL children attending Head Start, these findings cannot provide causal estimates of the relative effectiveness of the languages used for instruction or the peer composition of classrooms. Consequently, this study cannot rule out alternative explanations for association between the classroom language context and children's vocabulary growth, such as the quality of instruction and of teacher-child interactions. Future research should examine how the classroom language context and classroom quality independently and jointly predict DLLs' vocabulary development. In particular, detailed observational measures of the quality, in addition to quantity, of teachers' speech in children's first and second languages are needed (Walsh, 2002).

In addition, while the goal of the present study was to examine the classroom as one important context in which children's vocabulary development takes place, I did not examine other important settings, such as the home. The home language environment is one of the primary determinants of children's vocabulary abilities upon preschool entry (Hammer et al., 2008; Hindman & Wasik, 2015). Future studies should examine the relative roles of the home and classroom language environments in determining DLL children's vocabulary trajectories in preschool and into the elementary grades.

While the indicators for the language of instruction allowed comparisons of the effects of the relative use of each language, teachers did not report on the specific activities for which they used each language. Furthermore, though I expect that teachers accurately reported on the languages that they used *the most* in their classrooms, prior studies have found that teachers can inaccurately recall the proportion of time they spend using English versus Spanish in the classroom (Stipek et al., 2001). An important area for future research is thus to collect detailed, observational measures of the languages used for specific instructional activities.

Another limitation to the current study is that I examined only one aspect of language development, receptive vocabulary. Language learning is a complex developmental process involving many skills other than vocabulary. Findings may have been distinct for other aspects of language, such as expressive vocabulary. Studies examining multiple aspects of language development are needed.

The results of this study showed that the language or languages that DLL children attending Head Start are exposed to in preschool are associated with development in their first and second languages. Through gaining a fuller understanding of the classroom and contextual factors that support or hinder vocabulary development in specific classroom contexts, practitioners and researchers may better support young DLLs who are vulnerable to developing future academic difficulties.

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